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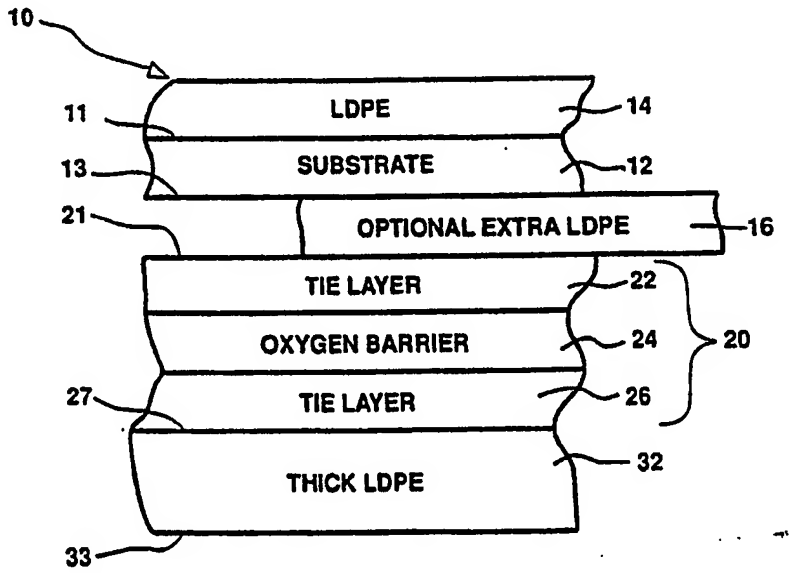

(57) Abstract

An oxygen barrier laminate structure (10) for producing an aseptic, oxygen barrier packaging or container comprising a substrate (12) having an inner surface and an outer surface, a first low density polyethylene layer (14) coated on the outer surface of the substrate, a multi-layer oxygen barrier coextrusion (20) coated interior to the substrate and a second, thick, low density polyethylene layer (32) coated on the multi-layer coextrusion. An optional extra low density polyethylene layer (16) may be added on the inside of the substrate. A photic barrier layer may also be employed.

OXYGEN BARRIER CONTAINER

BACKGROUND OF THE INVENTION

This invention relates generally to food and beverage packagings and, more particularly, to oxygen barrier laminate structures for producing aseptic packagings and containers.

Heat-sealable low density polyethylenes are popular components of current paperboard food and non-food packagings and containers. To provide a suitable barrier to oxygen and light transmission, structures with materials such as aluminum foil have been utilized in the production of these paperboard packagings. However, the unrestricted use of aluminum foil in any packaging renders that packaging non-microwaveable.

Oxygen permiability is a key consideration in aseptic, shelf-stable packaging because if oxygen is allowed to react with a food or beverage product it can result in deterioration of many aspects of product quality. Attempts have been made to produce an oxygen barrier container without the use of aluminum foil. One such type of container also has the requirement that the laminate used to form the container must have a very thin inner or product contact layer (0.7 mil or less) of low density polyethylene (LDPE) in order to achieve its desired results of minimizing absorption of essential flavor oils contained in citrus juice and other beverage products. Such a thin product contact layer is not

In one method of manufacturing the aseptic packaging of the present invention, a flat card ("blank") is first produced which is made of several layers of material bonded together. This multi-layer structure composition is the subject of the present patent application. In one type of packaging of the present invention, the blank takes the final form of a rectangular shaped box enclosed on all six sides (top, bottom, and four walls) of the box.

In the manufacturing process of the packaging material, the final step is to form a sleeve, for example as described in U.S. Patent Number 4,239,150. In this step, the two sides of the flat multi-layer blank are brought together to form a back seam by flame sealing, thus producing the sleeve.

In the aseptic filling process, the sleeve is placed on a mandrel which allows for the formation of the bottom seals of the package. The bottom seals are formed by heat and pressure, utilizing the thick LDPE inner layer of the multi-layer sleeve. The heat applied to the inner-most layer of the multi-layer sleeve enables it to "flow" to fill voids and cavities. The interior of the open-top box, including all inner seal areas, is then sterilized with hydrogen peroxide vapor which is then evaporated. Sterilized product is then deposited through the top opening to fill the box. The top portion of the box is then closed and thermally sealed.

Thus the seals formed in an aseptic package serve a structural (i.e., rigidity), a mechanical (i.e., liquid tight) and a biological (i.e., microbial seal) purpose.

SUMMARY OF THE INVENTION

In aseptic packaging of the present invention, the inner product contact layer will preferably be of a thickness of at least 1.4 mil (32 g/m^2) or greater to allow for "flowing" of the product contact layer in critical seal areas when the packaging is formed and shaped so as to fill all the voids and thereby create a sterilizable seal as well as a structural and liquid seal for the product contents. In one preferred embodiment of the present invention, the product contact layer is a 1.7 mil (40 g/m^2) thick layer of LDPE.

The present invention is a multi-layer oxygen barrier structure having a substrate, preferably a paperboard layer, on the outside of which is a layer of LDPE. On the inside of the paperboard is an adhesive tie layer. On the inside of the tie layer is an oxygen barrier material, preferrably an ethylene vinyl alcohol copolymer (EVOH). On the inside of the oxygen barrier layer is a second adhesive tie layer. Finally, on the inside of the second adhesive tie layer is a thick layer of LDPE.

The invention also provides an embodiment comprising an oxygen barrier laminate structure for producing an aseptic oxygen barrier container comprising a substrate having an inner and an outer surface, a first LDPE layer coated on the outer surface of the substrate, a multi-layer extrusion having an inner surface and an outer surface wherein the outer surface of the multi-layer extrusion is coated on the inner surface of the substrate, the multi-layer extrusion

It is another object of the invention to provide an oxygen barrier packaging which is suitable for microwave ovenable applications.

It is yet another object of the invention to provide an oxygen barrier packaging which controls light transmission through the packaging. Other objects and advantages of the invention will become apparent to those skilled in the art upon review of the following detailed description, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged, cross-sectional view of the laminate structure of the present invention; and

FIG. 2 is an enlarged, cross-sectional view of another embodiment of the laminate structure of the present invention.

Before one embodiment of the invention is explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it should be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

coextrusion is comprised of a first adhesive tie layer 22, an oxygen barrier layer 24 and a second adhesive tie layer 26. The multi-layer coextrusion is preferably secured onto the inner surface 13 of the substrate 12 in the order listed. In this order, the first adhesive tie layer 22 is contacting the substrate while the second adhesive tie layer 26 is the inner-most layer of the multi-layer coextrusion. However, another option of the present invention is to provide an extra layer 16 of LDPE to the structure 10 which would lie between the substrate 12 and the outer surface 21 of the multi-layer coextrusion 20. This embodiment provides extra adhesion depending upon the materials used for the substrate 12 and the tie layer 22. This extra LDPE layer 16 would preferably be about 10 g/m^2 thick although a wide range of thicknesses could be employed effectively.

The thickness of the multi-layer coextrusion 20 may vary depending upon the packaging application. However, when the structure 10 is being used to produce an aseptic juice container, the thickness of the multi-layer coextrusion 20 is preferably about 1.2 mil (30 grams per square meter). When the thickness of the multi-layer coextrusion is about 1.2 mil, the thickness of the first adhesive tie layer 22 is preferably about .43 mil (10 grams per square meter), the thickness of the oxygen barrier layer 24 is preferably about .33 mil (10 grams per square meter), and the thickness of the second adhesive tie layer 26 is preferably about .43 mil (10 grams per square meter).

voids or cavities where the layer 32 has not sufficiently "flowed" to fill the voids or cavities, resulting in difficulty in sterilizing the packaging.

Various suitable coating techniques can be utilized to apply the layers to the substrate 12. For example, the substrate 12, preferably paperboard, may be flame treated and then a layer of molten LDPE may be coated onto one surface of the substrate by extrusion coating. The multi-layer coextrusion may be extrusion laminated onto the uncoated surface of the substrate or onto the optional extra LDPE layer 16 if used. Finally, a second LDPE layer may be extrusion coated onto the inner surface of the multi-layer coextrusion to complete the laminate.

In another embodiment of the present invention, as shown in FIG. 2, a pigment dye may be added to a layer 62 preferably LDPE which may be extrusion coated or laminated onto the inner surface 57 of the tie layer 56. Then the inner, thick LDPE layer 64 is coated or laminated onto the pigmented LDPE layer 62. Pigmented polyethylene is available from Quantum Chemical. Once extruded onto the structure 40, preferably in the order shown in FIG. 2, the layer 62 will act to inhibit or block light transmission. The tinted layer 62 is typically 10-12 g/m^2 thick in one preferred embodiment. The tinted layer 62 plus layer 64 would not be less than 1.4 mil thick. The remaining layers 42, 44, 52, 54, and optional LDPE extra layer 46, and surfaces 41, 43,

CLAIMS

What is claimed is:

1. An aseptic container prepared from an oxygen barrier laminate structure, said laminate structure comprising:

a substrate having an inner surface and an outer surface;

a first low density polyethylene layer coated on said outer surface of said substrate;

a multi-layer coextrusion having an inner surface and an outer surface wherein said outer surface of said multi-layer coextrusion is coated interior to said substrate, said multi-layer coextrusion comprising a first adhesive tie layer, an oxygen barrier material layer and a second adhesive tie layer; and

a second low density polyethylene layer coated on said inner surface of said multi-layer coextrusion, said second low density polyethylene layer having a thickness of at least 1.4 mil.

2. The structure of Claim 1 wherein said oxygen barrier material layer is an ethylene vinyl alcohol copolymer.

3. The structure of Claim 2 wherein said adhesive tie layers are an ethylene-based copolymer with functional groups.

a multi-layer coextrusion of a total thickness of about 1.1 mil, having an inner surface and an outer surface wherein said outer surface of said multi-layer coextrusion is coated interior to said substrate, said multi-layer coextrusion comprising a first adhesive tie layer about 0.4 mil thick, an ethylene vinyl alcohol copolymer, oxygen barrier layer about 0.3 mil thick, and a second adhesive tie layer about 0.4 mil thick, coated in the order listed; and

a second low density polyethylene layer of at least 1.4 mil thick, coated on said inner surface of said multi-layer coextrusion, such that during formation of said container said second low density polyethylene layer is sufficiently thick to fill and caulk any voids and thereby provide a biological seal and a sterilizable inner surface to said container.

10. The structure of Claim 9, further comprising: a photic barrier layer of low density polyethylene coated on said inner surface of said multi-layer coextrusion, wherein said photic barrier layer is about 0.4 mil thick and wherein said second low density polyethylene layer together with said photic barrier layer is at least 1.4 mil thick.